

## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



Reserve  
aTS1975  
.C56

**United States  
Department of  
Agriculture**

Food Safety  
and Inspection  
Service

# A Study on Inspection of Swine Uteri

E. Ciolfi, D.V.M.

JANUARY 1983

SLAUGHTER INSPECTION STANDARDS AND PROCEDURES DIVISION  
MEAT AND POULTRY INSPECTION TECHNICAL SERVICES

AD-33 Bookplate  
(1-52)

**NATIONAL**

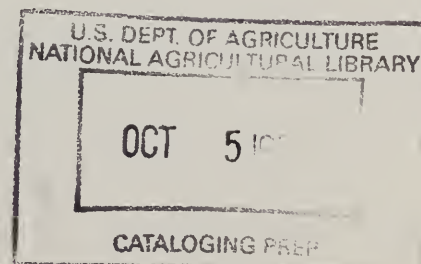
**A  
G  
R  
I  
C  
U  
L  
T  
U  
R  
A  
L**



**LIBRARY**

## C O N T E N T S

STUDY TEAM	iii
SUMMARY	iv
OBJECTIVE	1
BACKGROUND	1
METHODOLOGY	3
Head and Carcass Inspection	3
Viscera Inspection	4
Gilt's Uterus	4
Difference in Procedures	5
Training	5
Sampling and Evaluation	5
Evaluation #1	6
Evaluation #2	7
Workload Analysis	7
Laboratory Sampling	7
RESULTS	7
Table 1 - Summary of Test Results	8
Table 2 - Percent Accuracy and Confidence Interval	9



DISCUSSION	10
Test Variability	10
Limitations	11
Responsibility	11
RECOMMENDATIONS	12
APPENDIX	13
Appendix A - Swine Post-Mortem Inspection	14
Appendix B - Use of Worksheet	16
Appendix C - Worksheet	18
Appendix D - Workload Analysis	19
Appendix E - Laboratory Analysis	21

## STUDY TEAM

Dr. E. Ciolfi  
Staff Officer, MPITS

Project Manager and  
Inspection Specialist

Dr. J. N. Archer  
Branch Chief, SCI, PE

Pathologist

Dr. W. T. Burke  
Branch Chief, SCI, MS

Mathematician

Mr. C. Jenner  
Industrial Engineer, MPITS

Work Standards Specialist





## A STUDY ON INSPECTION OF SWINE UTERI

### SUMMARY

Based on industry requests to save swine uteri for domestic human consumption, the effectiveness and productivity of three post-mortem inspection procedures were tested at a market hog slaughter plant. The procedures tested were:

- (1) observation only; (2) observation with palpation when required; and
- (3) observation and palpation.

The statistical, bacteriological, and histopathological analyses revealed no significant differences in effectiveness among the three procedures. However, the workload analysis revealed a difference in productivity.

It is recommended that the procedure including observation with palpation when required be implemented at plants requesting to save swine uteri for human consumption.



## OBJECTIVE

In response to industry's requests to save and market swine uteri as edible product for domestic human consumption, a study was conducted to determine the inspection procedures necessary to inspect the uteri.

The objective of this study was to evaluate and compare the effectiveness and productivity of three post-mortem inspection procedures. These are:

- (1) Observation only
- (2) Observation with palpation when required
- (3) Observation and palpation

Another objective of the study was to collect tissue samples for laboratory analyses to determine whether any microbiological or histopathological conditions exist in "normal" appearing uteri that would affect their wholesomeness if used as human food.

## BACKGROUND

Generally, in the United States, uteri are considered inedible, are removed from the rest of the viscera during carcass preparation and are handled as inedible product. However, under the Federal Meat Inspection Act, any meat or meat food product can be saved for edible purposes if it has passed inspection, is not adulterated and is properly labeled. Uteri meet these criteria and, therefore, are eligible for use as human food.

In recent years, some parts of industry have shown interest in saving uteri as edible product for export to certain countries. Based on the Federal Meat Inspection Act and on the requirements of importing countries, the Department

has permitted the saving and exporting of nongravid uteri from gilts if they are:

1. Handled as edible product.
2. Free of any pathological or physiological process, such as hyperemia, enlargement from estrus, etc.
3. Free of any contamination, such as ingesta, feces, bile.
4. Inspected and passed.
5. Properly labeled.

The primary purpose of post-mortem inspection is to detect signs of diseases and other unwholesome conditions that may render carcasses, or some of their organs, unfit for human food. Carcasses or organs determined to be unwholesome are condemned, properly disposed of, and are not permitted to be sold for human consumption.

Routine post-mortem inspection of swine is divided into three phases: head inspection, viscera inspection, and carcass inspection. During inspection of each of these phases, an inspector performs specific inspection procedures, which involve a sequence of observing, palpating and, in the case of head inspection, incising certain lymph nodes. These procedures have proved to be a workable and acceptable method of inspection.

During viscera inspection, the inspector examines all organs to determine whether they are fit for human food. It is during this phase of inspection that the uteri can be examined easily, if they are presented for inspection so the inspector can readily observe them with the rest of the viscera and

palpate them when necessary.

The Slaughter Inspection Standards and Procedures Division has the responsibility to design and develop the most effective and efficient methods to inspect animals at slaughter. The procedures tested during this study meet this responsibility by offering the most effective and efficient method of examining swine uteri together with the other organs during the routine viscera inspection.

#### METHODOLOGY

The study was conducted at a large plant slaughtering market hogs on a moving line of 741 hogs per hour. Routine post-mortem inspection was carried out at three stations by five inspectors--two at the head inspection station, two at the viscera inspection station, and one at the carcass inspection station.

In general, the number of inspectors assigned to swine post-mortem inspection at a plant is related to the size of the plant and the speed of operation. In small plants with a slow slaughter rate, one inspector may complete all inspection procedures at one station; in larger plants with faster line speeds, two or more inspectors complete the inspection procedures at the head, viscera and carcass stations.

#### Head and Carcass Inspection

The head and carcass inspection procedures (see Appendix A) were not changed during the study.



## Viscera Inspection

The current viscera inspection procedures were changed to include examination of the uteri (see Figure below). After head inspection, the carcasses were eviscerated and positioned so that the ventral surfaces faced the viscera inspectors. At the viscera inspection station there were two inspectors; each one inspected every other set of viscera. The current inspection procedures (see Appendix A) require the inspectors to observe the eviscerated carcass for disease conditions and dressing errors, and to observe and/or palpate various abdominal and thoracic structures, including the liver, spleen, lungs, heart, stomach, intestine, and lymph nodes. Other duties of the viscera inspectors include retaining carcasses for veterinary disposition and marking condemned viscera or parts.



Gilt's Uterus

## Difference in Procedures

All steps of the current viscera inspection procedures, except step 1, are the same in the proposed procedures. This step differs as follows:

Current- Observe eviscerated carcass, viscera, and parietal (top) surface of spleen.

Proposed- Observe eviscerated carcass, viscera, parietal (top) surface of spleen, and uterus; palpate uterus when required.

## Training

Before testing, training of plant employees and inspection personnel was necessary. The project manager first conducted on-the-job training meetings with the plant employees involved in saving and presenting the uteri for inspection; then, he trained the inspectors assigned to post-mortem inspection on the proposed procedures until each inspector seemed competent in examining the uteri with the rest of the viscera.

## Sampling and Evaluation

After the plant and inspection personnel were trained, a pilot test was conducted to allow plant employees and inspectors to become familiar with the testing process and to allow the project manager to make any adjustments before the actual test began. During the pilot test, data were collected and reviewed, but were not included in this report.

Upon completion of the pilot test, the actual test began. To compare the effectiveness of the three procedures, two evaluation sites were used--the viscera inspection station and the viscera separation room. This was necessary because the time and space were not sufficient to observe and incise the uteri and evaluate the procedure in the moving viscera pans.

At the viscera inspection site, for 3 days, the veterinary evaluator randomly selected from 4900 viscera sets a total of 1000 samples--300 that had been inspected using the observation only procedure; 400 that had been inspected using the observation with palpation when required procedure; and 300 that had been inspected using the observation and 100 percent palpation procedure. At the viscera separation site, the veterinary evaluator randomly selected 50 additional samples that had been inspected by the observation with palpation when required procedure. These 50 samples were forwarded to field and National laboratories for histopathological and microbiological analyses. Following the instructions in Appendix B, the evaluation results were recorded on a worksheet (see Appendix C).

Testing of the sampled uteri which were inspected under one of the three procedures studied was done in two evaluations--Evaluation #1 and Evaluation #2.

#### Evaluation #1

This evaluation was performed at the viscera inspection station. The veterinary evaluator was positioned down the line from the inspectors so that he could not see which one of the three inspection procedures was being performed. The recorder was positioned in the same area as the evaluator.

The two viscera inspectors were instructed to perform one of the three procedures. After the uteri were inspected with the viscera by the inspectors, they were closely examined by the veterinary evaluator for pathological lesions, physiological changes, and dressing errors. Each uterus evaluated and each lesion or error missed by the inspectors were recorded on a worksheet by the recorder. This procedure was performed until 100 uteri were evaluated and tallied. Then, the inspectors were instructed to switch to another procedure



and the veterinary evaluator began selecting and evaluating 100 units. This process was repeated until the required number of units for each procedure was reached.

#### Evaluation #2

This evaluation was performed in the viscera separation room. The viscera inspectors were instructed to perform the observation with palpation when required procedure and a plant employee was instructed to randomly select 100 uteri. From these, 50 were randomly selected, incised, and evaluated by a veterinary evaluator. The results were recorded on a worksheet.

#### Workload Analysis

To determine the time required for inspecting uteri, a workload analysis of the three proposed procedures was performed (see Appendix D). The inspectors were video-taped while performing each inspection procedure under actual operating conditions.

#### Laboratory Sampling

After testing, tissue samples were collected for microbiological and histopathological analyses to determine whether any conditions exist in "normal" appearing uteri that would affect their wholesomeness. Results of the analyses are shown in Appendix E.

### RESULTS

The Mathematics and Statistics Division evaluated the data collected during the study and performed a statistical analysis. The test results for each of the three procedures tested are summarized in Table 1, Summary of Test Results. The percent accuracy and confidence interval by procedure and error

type are listed in Table 2, Percent Accuracy and Confidence Interval (CI). The true number of error-free units for the three procedures is contained in the 95 percent confidence interval. If the intervals overlap, there is no statistical difference in error rates. All intervals overlap for pathological, physiological, dressing, and total errors. Therefore, the difference in error rates among the three procedures is not statistically significant.

The results of the microbiological and histopathological analyses of the 50 samples revealed no significant findings (see Appendix E).

In addition to the statistical data, the Industrial Engineering and Data Management Division collected work measurement data and performed a workload analysis (see Appendix D). This analysis indicated that the observation with palpation when required procedure was the most feasible; however, slightly more work and time was required.

Table 1 - Summary of Test Results

Procedure No. <u>1</u> /	Units Evaluated	Units Free of Errors	Percent Accuracy
1	300	299	99.7
2	450	447	99.3
3	300	299	99.7

1/ No. 1: Observation only. No. 2: Observation with palpation, when required.  
No. 3: Observation and palpation.

Table 2 - Percent Accuracy and Confidence Interval (CI)

Procedure No. <u>1</u> /	Error Type	Units			95% CI
		Evaluated	Free of Errors		
			Total	Percent	
1	Pathological	300	300	100.0	98.8 - 100.0
	Physiological	300	299	99.7	98.2 - 99.9
	Dressing	300	300	100.0	98.8 - 100.0
	Total	300	299	99.7	98.2      99.9
-----					
2	Pathological	450	450	100.0	99.2 - 100.0
	Physiological	450	447	99.3	98.1 - 99.9
	Dressing	450	450	100.0	99.2 - 100.0
	Total	450	447	99.3	98.1      99.9
-----					
3	Pathological	300	300	100.0	98.8 - 100.0
	Physiological	300	299	99.7	98.2 - 99.9
	Dressing	300	300	100.0	98.8 - 100.0
	Total	300	299	99.7	98.2      99.9

<sup>1</sup>/ No. 1: Observation only. No. 2: Observation with palpation, when required.  
No. 3: Observation and palpation.

## DISCUSSION

### Test Variability

To prevent or reduce variability and bias, the evaluation process was based on the following:

1. The inspectors rotated assignments and each had an opportunity to perform the test procedures.
2. The procedures to be tested were randomly selected and the inspectors were instructed when to perform them.
3. The evaluator was so positioned down the line that he could not see which procedure he was evaluating.
4. The evaluator and recorder did not know which procedures the inspectors were performing; they were simply instructed to evaluate and record 100 units and, when one worksheet was completed, to repeat the evaluation and recording for 100 more units. This was done until the required number of units was reached.
5. When a worksheet was completed, it was identified with a code of the procedure that had been evaluated.
6. The evaluator did not see the worksheets, nor did he know which procedures he had evaluated, until all testing was completed.



## Limitations

The participating plant in this study was not randomly selected. It was selected, mainly, because it was saving swine uteri for export and also on the basis of other factors, such as:

1. Adequate facilities and space to locate the evaluator and the recorder at the evaluation sites.
2. Adequate lighting and platforms at such sites.
3. Chain speed and daily slaughter to sample and evaluate the required number of units.
4. Plant management cooperation.

The proposed procedures were used only during 3 days of familiarization.

If a set of viscera was retained, or condemned, it was assumed that the inspectors noted all lesions and dressing errors for which the viscera, including the uteri, should have been retained or condemned.

## Responsibility

As for the current inspection procedures, plant management has to assure all viscera, including the uteri, are presented for inspection adequately so the inspectors need not perform additional motions to examine them.

The proposed procedures will not change any of the inspectors' other responsibilities. For example, when a disease condition or a dressing error requires action on the inspectors' part, such as tagging the carcass and

viscera, including the uterus, the inspectors will take that action.

#### RECOMMENDATIONS

The study team concluded that from the three procedures tested--(1) observation only; (2) observation with palpation, when required; and (3) observation and 100 percent palpation--the second procedure should be implemented. Based upon this study, such procedure was more effective than the observation only procedure and less time consuming, but as effective, than the observation with 100 percent palpation procedure.

# A STUDY ON INSPECTION OF SWINE UTERI

## APPENDIX





## Appendix A - Swine Post-Mortem Inspection1/

### HEAD

1. Observe head and cut surfaces.
2. Incise and observe mandibular lymph nodes.
3. Observe/retain carcass, when required.

### VISCERA

1. Observe eviscerated carcass, viscera, and parietal (top) surface of spleen.
2. Observe and palpate mesenteric lymph nodes.
3. Palpate portal lymph nodes.
4. Observe dorsal surfaces of lungs.
5. Palpate bronchial lymph nodes.
6. Observe mediastinal lymph nodes.
7. Turn lungs over and observe ventral surfaces.
8. Observe heart.
9. Observe dorsal surface of liver.
10. Turn liver over and observe ventral surface.
11. Condemn viscera or parts when required.
12. Retain carcass, viscera, and parts when required.

## Appendix A (Continued)

### CARCASS

1. Look in mirror and observe back of carcass.2/
2. Observe front parts and inside of carcass.
3. Grasp, turn, and observe kidneys (both sides).
4. Direct trim, remove retain tags, or retain carcass when required.

1/ Inspectors must examine carcasses, organs, and parts for diseases, abnormalities, cleanliness.

2/ Where mirror is not required, turn and observe back of carcass.

## Appendix B - Use of Worksheet

The worksheet is designed according to the functions involved, and is intended to be used for recording data necessary to test and analyze the feasibility of three procedures to inspect swine uteri. Use each sheet to evaluate 100 units.

The worksheet includes categories and subcategories. The information recorded should show (1) tallied units examined, (2) tallied and total units with errors, and (3) total errors.

As instructed, examine 100 units for each procedure. Select the units as randomly as possible throughout the day's operation.

One unit is represented by the uterus (body and tubes) and the ovaries.

Tally each unit examined by placing a slash in each of the 100 circles at the bottom of the worksheet to keep track of how many units have been evaluated.

The numbers 1-15 across the top of the worksheet indicate the units with errors. Score all errors found on the first uterus in column 1, all errors found on the second uterus in column 2, etc. Score under pathology, physiological changes, and dressing errors only those uteri with errors. If one or more errors are noted in one unit, tally them in the appropriate spaces next to the subcategories and in the same column. If several errors are of the same type, indicate the number in the appropriate space.

For contamination (feces, ingesta, urine, bile), score an error when it is of sufficient extent that correction would have been called for if it had been recognized at the point of inspection.

## Appendix B (continued)

The subcategory "other" is for errors which may not be scored under other subcategories, or to identify an error which may be considered a particular problem.

# Appendix C - Worksheet

WORKSHEET SWINE Uterus INSPECTION		1. Est. No.	2. Location (City, State)		3. Chainspeed		4. Procedure <input type="checkbox"/> Current <input type="checkbox"/> Proposed		5. No. of Inspectors		6. Date																							
Category	SUBCATEGORY	UNITS WITH ERRORS															TOTAL																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																		
PATHOLOGY	7. Contamination (Pathological)																																	
	8. Abscess																																	
	9. Neoplasm																																	
	10. Metritis																																	
	11. Other (specify)																																	
PHYSIOLOGICAL CHANGES	12. Enlargement																																	
	13. Hyperemia																																	
	14. Pregnancy																																	
	15. Other (specify)																																	
DRESSING ERRORS (CONTAMINATION)	16. Feces/Ingesta																																	
	17. Urine																																	
	18. Bile																																	
	19 Other (specify)																																	
20. Units Examined (Tally each unit)																																		
1	2	3	4	5	16	17	18	19	20	31	32	33	34	35	46	47	48	49	50	61	62	63	64	65	76	77	78	79	80	91	92	93	94	95
6	7	8	9	10	21	22	23	24	25	36	37	38	39	40	51	52	53	54	55	66	67	68	69	70	81	82	83	84	85	96	97	98	99	100
11	12	13	14	15	26	27	28	29	30	41	42	43	44	45	56	57	58	59	60	71	72	73	74	75	86	87	88	89	90					

21. Remarks (If additional space is needed, use reverse)





## Appendix D - Workload Analysis

Objective: to determine the workload requirements for inspecting swine uteri and the impact this inspection would have on the current standards of the three to seven inspectors configurations.

### Methods of Accomplishment

Three post-mortem inspection procedures were tested to determine their effectiveness and motion efficiency. These procedures consisted of:

- (1) observation only; (2) observation with palpation when required; and
- (3) observation and palpation.

The test inspection configuration was the viscera inspection station at a swine slaughter plant with a slaughter rate of 741 hogs per hour and two inspectors assigned to the viscera inspection.

The team performing the test consisted of representatives from the Slaughter Inspection Standards and Procedures Division, the Pathology and Epidemiology Division, and the Industrial Engineering and Data Management Division.

The project required a study involving the following steps:

1. The project manager verified that the inspectors were performing the prescribed procedures and recommended when videotaping should begin.

## Appendix D (Continued)

2. Each inspector was videotaped while performing the proposed procedures under actual operating conditions.

3. The video tapes were reviewed and analyzed. Scenes from each procedure were identified and used for calculating the work measurement standards.

4. Calculations based on all work measurement data, including pro rata data, were completed.

5. The work measurement standard for performing each proposed procedure was calculated.

6. The study was documented.

### Productivity

The analysis results of the work measurement data collected during the study indicated:

1. "Observation only" would not change the inspector's productivity.

2. "Observation with palpation when required" would decrease the inspector's productivity about 3 percent.

3. "Observation and palpation" would decrease the inspector's productivity about 5 percent.



## Appendix E - Laboratory Analysis

To determine whether any histopathological and/or microbiological conditions existed in the uteri that were inspected and passed by the inspectors and were intended for human consumption, tissue samples were collected and submitted to appropriate laboratories.

### Inplant Sampling

After the effectiveness and efficiency tests were completed on three inspection procedures, the inspectors were instructed to use the procedure including routine observation of the uteri with palpation only when required.

For histopathological examination, 100 uteri were first randomly selected from the inspected and passed uteri; then, from the 100, 24 were again randomly selected. From the 24 uteri, 48 tissue samples were collected of which 24 were submitted to one laboratory and 24 to another laboratory.

For microbiological examination, 40 samples (uteri) with the iliac lymph nodes from the corresponding carcasses were randomly selected on the line while the inspectors were performing the same procedure. Thirty of these samples were selected from the uteri that were inspected and passed by the inspectors. The other 10 samples were selected from uteri with marked physiological changes (enlargement, hyperemia, etc.), which were segregated by plant employees at the carcass opening station and were handled as inedible product. Twenty of the 40 samples collected were submitted to one laboratory and the other 20 to another laboratory.

## Appendix E (Continued)

### Histopathological Examination

The histopathological examinations of the sections taken from the 24 samples submitted to the two laboratories revealed no significant alterations in any of them. The results of these examinations are summarized as follows:

1. Eight samples - Histologic examination of sections through the ovaries, oviducts and uterine horns revealed no remarkable histologic alterations. There were several eosinophils scattered throughout the ovaries, but their presence was not considered significant.
2. Four samples - Histologic examination of sections through the ovaries, oviducts and uterine horns revealed no remarkable histologic alterations. There were several eosinophils scattered throughout the ovaries, and lamina propria of the uterus (especially adjacent to the uterine glands), but their presence was not considered significant.
3. Six samples - Histologic examination of sections from the uterine horns, ovaries and fallopian tubes did not reveal any pathological changes.
4. Two samples - Histologic examination of the submitted tissues did not reveal any significant pathological alterations. The ovaries had numerous follicles in various stages of development. The uterine tubes and uterus had scattered mononuclear leukocytes in the mucosa. Special staining did not reveal pathogenic organisms.

## Appendix E (Continued)

5. One sample - Histologic examination of the submitted tissues did not reveal any significant pathological alterations. The ovary had numerous follicles in various stages of development. The wall of the uterus was congested and edematous. There were scattered polymorphonuclear and mononuclear leukocytes in the mucosa. The epithelium was hyperplastic. Special staining did not reveal any pathogenic organisms.

6. One sample - Histologic examination of the submitted tissues did not reveal any significant pathological alterations. The ovaries had numerous follicles in various stages of development. The uterine mucosa was slightly congested and had scattered mononuclear leukocytes. Special staining did not reveal pathogenic organisms.

7. One sample - Histologic examination of the submitted tissues did not reveal any significant pathological alterations. The ovaries had numerous follicles in various stages of development. Atretic follicles with foci of mineralization were present. The wall of the uterus was congested and edematous. There were scattered infiltrations of polymorphonuclear and mononuclear leukocytes. The epithelium was hyperplastic. Special staining did not reveal any etiologic agents.

8. One sample - Histologic examination of the submitted tissues did not reveal any significant pathological alterations. The ovaries had numerous follicles in various stages of development. There were several atretic

## Appendix E (Continued)

follicles with foci of mineralization. The uterine mucosa was slightly congested and had scattered mononuclear leukocytes. Special staining did not reveal pathogenic organisms.

### Microbiological Examination

All examinations made on the 40 samples submitted to the two laboratories failed to reveal the presence of *Brucella* sp. organisms.

Initial isolations were attempted in *Brucella* broth and on *Brucella* agar, and were incubated for 48 hours at 37°C under 10% carbon dioxide atmosphere. All isolated bacterial colonies were subcultured to *Brucella* agar and reincubated for 48 hours at 37°C under 10% CO<sub>2</sub>. Any suspicious colonies were transferred to Christensen's Urea slants. All cultures were negative for *Brucella* sp.





